

WO 03/107550

PCT/DE03/01968

Description

Method for making contact between at least one module
for wire-free radio standards and at least one
5 application

The present invention relates to a method for making
contact between a module for wire-free radio standards
and an application, and to a corresponding combination
10 of a module with an application.

Modules for wire-free radio standards, which have
complete GSM/GPRS functionality, so-called wireless
modules, are being used in increasing numbers in
15 applications, for example in mobile computing systems,
in PDAs and in portable and lightweight telematics
systems. In this case, wireless modules are subject to
specific requirements. Firstly, their physical size
should be as small as possible in order that they can
20 be used well and occupy little space. Depending on the
application, they should be chosen such that height,
width and/or length are/is small and appropriate. By
way of example, a small physical height is the critical
factor for PDAs. Furthermore, in accordance with their
25 specification, the wireless modules must have adequate
transmission power. This is particularly due to the
fact that the modules are integrated in an application
and the connecting lines that are required cause
losses. Furthermore, a long operating period is
30 desirable. The wireless modules should be capable of
being installed easily and quickly in the various
applications, and should be capable of being replaced
easily and quickly by other modules with the same or
with an upgraded functionality.

35

Commercially available wireless modules have until now
been connected to an application, for example to a
motherboard

- 2 -

of a PDA via plug connectors, such as board-to-board connectors, or via flat ribbon cable connectors. However, this results in a number of disadvantages. The stated connection options consume a large amount of space and are not suitable for miniaturization. Furthermore, the contact is unreliable when using flat ribbon cables. This is due, inter alia, to the desire for further miniaturization and to the reduction which this results in in the distances between the individual lines in the flat ribbon cable. The reduction in the conductor cross sections of the connecting lines which is likewise involved with miniaturization results in a high electrical contact resistance. In addition, inadequate contact between the module and a heat sink results in a high thermal contact resistance. The ground contact between the module and the application is inadequate, owing to the high resistance of the connecting line. An RF (radio-frequency) connection between a module and an application or an antenna is normally made via a plug and socket system or via a soldered coaxial cable. While the first variant is quite costly, the second option (soldering) does not allow thermal effects to be precluded, which can change the behavior of the module.

Since the distance between the contacts on the flat ribbon connector or board-to-board connector is very short, it is difficult to use the contact points as test points while manufacturing the modules. Furthermore, the modules must be manually mounted on an application. Plug insertion, screwing, clamping and soldering processes are normally used for mounting. Owing to this problem on the one hand and the inadequate definition and standardization of interfaces for the customer application on the other hand, a module can be replaced by another module with a different functionality only with major effort. In contrast, it is desirable

to have a technical solution which is optimized and standardized not only for the technical parameters, for example low thermal resistance between the heat source on the module and the heat sink on the application, low
5 electrical resistance for the signal and voltage supply between the module and the application, defined electrical impedance of the RF connections between the module and the application, but also for mounting and adaptation.

10 One object of the present invention was therefore to provide a method and a corresponding arrangement which allow contacts to be made as functionally, quickly and simply as possible, while saving as much space as
15 possible.

This object is achieved by the method according to the invention as claimed in claim 1 and by a combination of a module with an application according to the invention
20 as claimed in claim 7. Advantageous embodiments are described in the corresponding dependent claims.

According to claim 1, a method is provided for making contact between at least one module for wire-free radio
25 standards and at least one application, with

- contact surfaces being provided on a side of the module which is intended to make contact with the application, and
- contact surfaces which can interact with the contact
30 surfaces of the module being provided on a side of the application which is intended to make contact with the module, and
- a connection being produced between the respective contact surfaces of the module and the application.

35 In one preferred embodiment of the method according to the invention, a detachable connection is provided

- 3a -

between the respective contact surfaces by means of a mechanical apparatus which allows the

module to be pushed into and out of the application, with the contact surfaces which are opposite one another when the module is in the inserted state forming a detachable connection. By way of example, the
5 mechanical apparatus includes a guide rail in the application, in which the module can be pushed in and out in an interlocking manner. The module can thus be replaced very simply and easily by another module having the same functionality or different
10 functionality. In order to make reliable electrical and thermal contact, mechanical elements such as pins or mechanical springs can advantageously be provided on the application side, pressing against the module contacts with an adequate spring force.

15 In contrast, in another preferred embodiment of the method according to the invention, a firm connection is provided between the respective contact surfaces. The respective contact surfaces are in this case preferably
20 soldered to one another. A further option is to press the two components together.

In a further preferred embodiment of the method according to the invention, the respective contact
25 surfaces are arranged in the form of a grid or of a specific array.

The contact surfaces are preferably formed by a metallic coating with a low electrical and/or thermal
30 resistance. Typical coatings are copper, aluminum and gold alloys.

The present invention furthermore covers a combination, having a module for wire-free radio standards and
35 having an application, with the module having contact

surfaces on a side which is intended to make contact with the application, and the application having contact surfaces on a side which is intended to make contact with the module, which latter contact surfaces
5 can interact with the contact surfaces of the module and can make contact with them.

In one preferred embodiment of the combination according to the invention, the respective contact
10 surfaces can be detachably connected to one another.

In another preferred embodiment of the combination according to the invention, the respective contact surfaces may, in contrast to this, be permanently
15 connected to one another. In this case, they can preferably be soldered or crimped to one another.

Furthermore, the respective contact surfaces are preferably arranged in the form of a grid.
20

Owing to the very small amount of space which is consumed for making contact with the module, the present invention allows a high degree of miniaturization to be achieved. Furthermore, reliable
25 contact is ensured particularly when soldering the respective contact surfaces to one another. Only a very low electrical and thermal contact resistance occurs in this case. In this case, the material system copper/solder (tin/lead system)/copper is used as the
30 electrical/thermal conductor. This results in a very good ground contact between the module and the application. Furthermore, according to the invention, it is possible to produce a direct contact between the RF connection and an application while, until now,
35 expensive RF connectors have been required for this purpose. Test points can easily be provided. This results in good contact and in simple handling during manufacture.

The invention provides the capability for automated mounting of the modules on the corresponding applications.

5 Further advantages will be indicated with reference to the following figures, in which:

Figure 1 shows a schematic illustration of the rear
face of a module of one embodiment of a
10 combination according to the invention, and
Figure 2 shows a schematic illustration of one
embodiment of a combination according to the
invention, having a module and an
application, in which the module and the
15 application can be detachably connected to
one another.

Figure 1 shows the rear face 1 of a module of a
combination according to the invention, having a module
20 and an application. The arrangement here has a
connecting point 2 for a power amplifier. Furthermore,
at least one ground contact 3 and at least one
connecting point 4 are provided for a voltage supply.
The smaller, rectangular contact surfaces represent
25 interfaces 5 for an application with which contact is
intended to be made. Alternatively, test points 6 for
manufacture and test points 7 for development can be
provided under the smaller rectangular contact
surfaces. Furthermore, an RF contact point 8 can
30 explicitly be provided.

Figure 2 shows a mechanical apparatus for holding a
module 2 in an application 1, as well as a module 2
which can be pushed into and out of this apparatus or
35 the application 1. The mechanical apparatus includes,
by way of example, a guide rail in the application 1,
in which the module 2 can be displaced in an
interlocking manner. When the module 2

is in the pushed-in state, the contact surfaces of the module 2 and the contact surfaces of the application 1 are opposite one another.